Syllabus for the written examination for the post of Overseer (Civil) (Grade – C)

Topics to be covered in the syllabus for the examination:

1. Building Materials
2. Strength of Materials and Theory of structures
3. Concrete Technology
4. Design of Steel and Concrete structures
5. Geotechnical Engineering
6. Transportation Engineering
7. Environmental Engineering
8. Fluid Mechanics and Hydraulics
9. Irrigation Engineering and Hydrology
10. Estimation, Costing and Valuation
11. Surveying

The details of these topics are mentioned below:

1) **Building Materials:** Building stones, bricks, cement, mortar, concrete, wood and timber-based materials, bituminous materials, paints and varnishes – standard tests, classification, propertiesand uses.

2) **Strength of Materials and Theory of Structures:** Elasticity, elastic constants, determinate and indeterminate structures like trusses, beams and frames, analysis of determinate trusses, bending moment and shear force diagrams of simply supported, cantilever and over hanging beams; moment of area and moment of inertia for rectangular, circular, triangular and hollow sections; bending stress and shear stress for rectangular, circular, triangular, tee (T), channel, hollow and compound sections; slopes and deflections of simply supported and cantilever beams subjected to point loads and uniformly distributed loads; eccentric loads and shear centre fixed and continuous beams, Claperyon's three moments theorem, retaining walls and dams, torsion of solid and hollow circular section, buckling of columns, critical load on columns.

3) **Concrete Technology:** Properties and types of concrete, uses of concrete, fine and coarse aggregates, water cement ratio, water quality, admixtures, storage, batching, mixing, placement, compaction, finishing and curing of concrete, mix design, quality control of concrete, temperature and weather effects, repair and maintenance.

4) **Design of Concrete and Steel Structures: -** Working Stress method and limit state design for RC beams, design of singly reinforced and doubly reinforced beams (simply-supported and cantilever) based upon flexural strength, shear strength, bond strength, design of T-beams, design of one-way slabs, two-way slabs, column, staircases, retaining walls and isolated footings.

Riveted and bolted connections, welded connections, design of steel members in tension and compression, design of steel columns, beams, plate

girders and roof trusses.

5) **Geotechnical Engineering:** Origin of soil, three phase diagram, relationships between parameters such as water content, void ratio, porosity, degree of saturation, air content, percentage air voids, specific gravity of soil grains, unit weights, density index, Index properties of soil, particle size distribution curves, Atterberg's limits, sensitivity of soil and thixotropy, ISI soil classification (ISSCS) and plasticity chart, soil permeability, Darcy's law, coefficient of permeability and its determination, unconfined and confined aquifers, effective stress, quick sand, compaction, consolidation, coefficient of compressibility, coefficient of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil, e – log p curve, computation of ultimate settlement, shear strength of soils, Direct shear test, Vane shear test, Triaxial test, earth pressure theories, active and passive earth pressures, bearing capacity of soils, Terzaghi's bearing capacity equation, Skempton and IS recommendations for calculation of bearing capacity, plate load test, standard penetration test, dynamic cone penetration test, static cone penetration test.

6) **Transportation Engineering:** Highway cross sectional elements, geometric design of highways, traffic engineering, speed-flow-density relationships, design of rotary, traffic signs and signals, road markings, types of pavements, pavement materials and standard tests on these materials, design of flexible pavements (IRC 37) and rigid pavements (IRC 58) – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, joints in rigid pavement, distresses in pavement and pavement maintenance, highway drainage.

Components of permanent way in railway – rails, sleepers, ballast, fixtures and fastening, geometry of railway tracks – geometric design, points and crossings, track junction, stations and yards.

7) **Environmental Engineering:** Water demand, quality of water, physical and chemical properties of water – laboratory tests, sources of water supply, intake of water, conveyance of water, purification of water – screening, sedimentation, filtration, disinfection, removal of hardness, distribution of treated water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments – anaerobic and aerobic, septic tanks, soakpits, cess pools.

Solid waste management – Generation of solid wastes, types of solid wastes, solid waste management system, landfills, composting, pyrolysis, incineration.

Air pollution – types of air pollutants, effects, causes and control measures.

Noise pollution – causes, effects and controlling measures.

8) **Fluid Mechanics and Hydraulics:** Fundamental properties of fluid, hydrostatics, kinematics of flow, continuity principle, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs and notches, flumes, pumps and turbines.

9) **Irrigation Engineering and Hydrology**: Types and methods of irrigation, advantages and disadvantages of irrigation, water requirement of crops – convective use of water, duty, delta, base period, crop types, commanded area, time factor, crop ratio, intensity of irrigation, irrigation efficiencies, different type of canals, loss of water in canals, canal lining, silting and scouring, Kennedy's theory and Lacey's theory of flow in unlined canals, design of lined canals, lift irrigation, shallow and deep wells, yield from a well, weirs and barrages, canal structures, Bligh's creep theory, land reclamation, characteristics of soil affecting fertility of soils, purposes, methods, description of land and reclamation processes, major irrigation projects in India.

Hydrology – Water cycle, measurement of rainfall, run off coefficient, rain gauge, losses from precipitation – evaporation, infiltration, definition of flood, causes of flood and its effects, methods of flood control, flood routing, water logging and preventive measures.

10) **Estimation, Costing and Valuation:** Estimation, technical terms, analysis of rates, methods and units of measurement, items of work – earthwork, brick work (modular & traditional bricks), RCC work, shuttering, timber work, painting, flooring, plastering, boundary wall, brick building, water tank, septic tank, bar bending schedule (BBS), Centre line method, Long wall – Short wall method, Mid-section formula, Trapezoidal formula, Simpson's rule; Cost estimate of septic tank, flexible pavements, tube well, isolated and combined footings, steel truss, pilesand pile-caps, bill of quantities (BOQ).

Cost and value, scrap value, salvage value, sinking fund, assessed value, depreciation and obsolescence, methods of valuation, CPM & PERT.

11) **Surveying:** Principles of surveying, chain surveying, compass surveying, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, levelling, types and methods of levelling, level book, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, contouring, methods of contouring, uses of contour map, tachometric survey, curve setting, calculation of earth works, total station.